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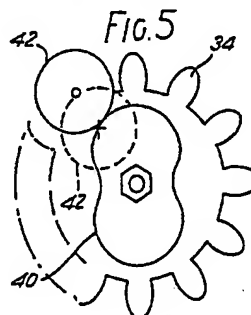
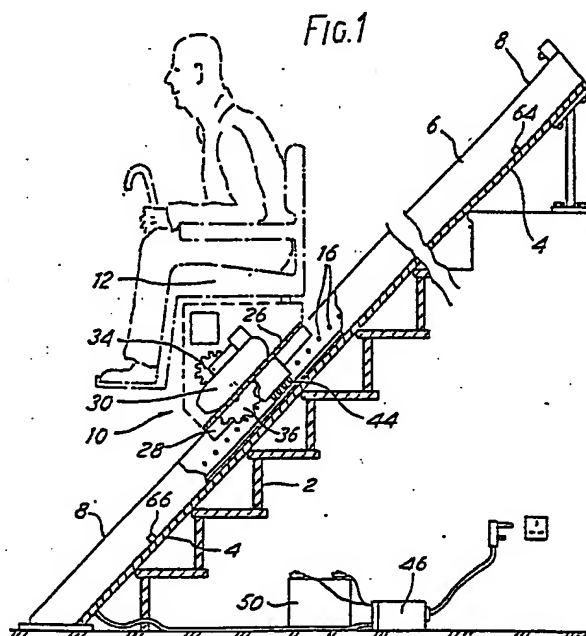
B8L

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## (54) Stairlift

(57) A stairlift to enable elderly or infirm persons to travel safely on a flight of stairs comprises a seat (12), Fig. 1 mounted on a carrier (10) adapted to travel on a rack-and-pinion arrangement (14,36) up and down a trackway on a flight of stairs. The trackway comprises a base member (4) on which are conductor rods mounted in recessed insulated grooves (22) for safety. These rods supply D.C. power (24 volts) to the motor (30) from the mains via a transformer and a rectifier via spring loaded brushes (44) provided on the carrier which brushes contact the rods (24). In the event of mains failure, a battery (50), remote from the carrier and the tracking and conveniently under the stairs, is brought into the circuit and provides power to prevent the user being stranded part-way on the stair flight. Wheel 34, which drives pinion 36, is provided with a fail safe device comprising a cam 40, Figure 5, with a follower 42 which cuts power to the motor and releases spring loaded plunger to engage the rack upon excessive speed.



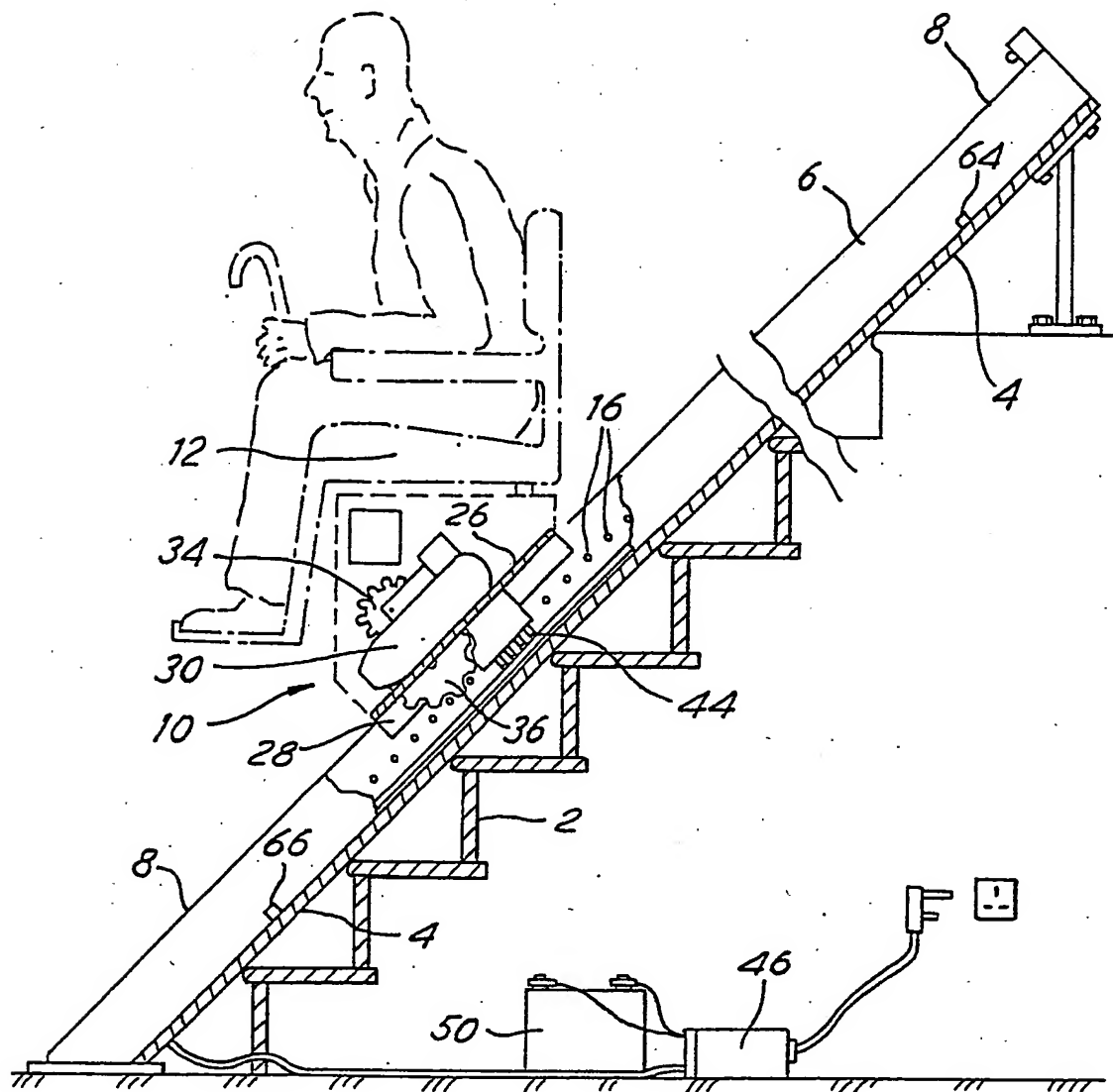
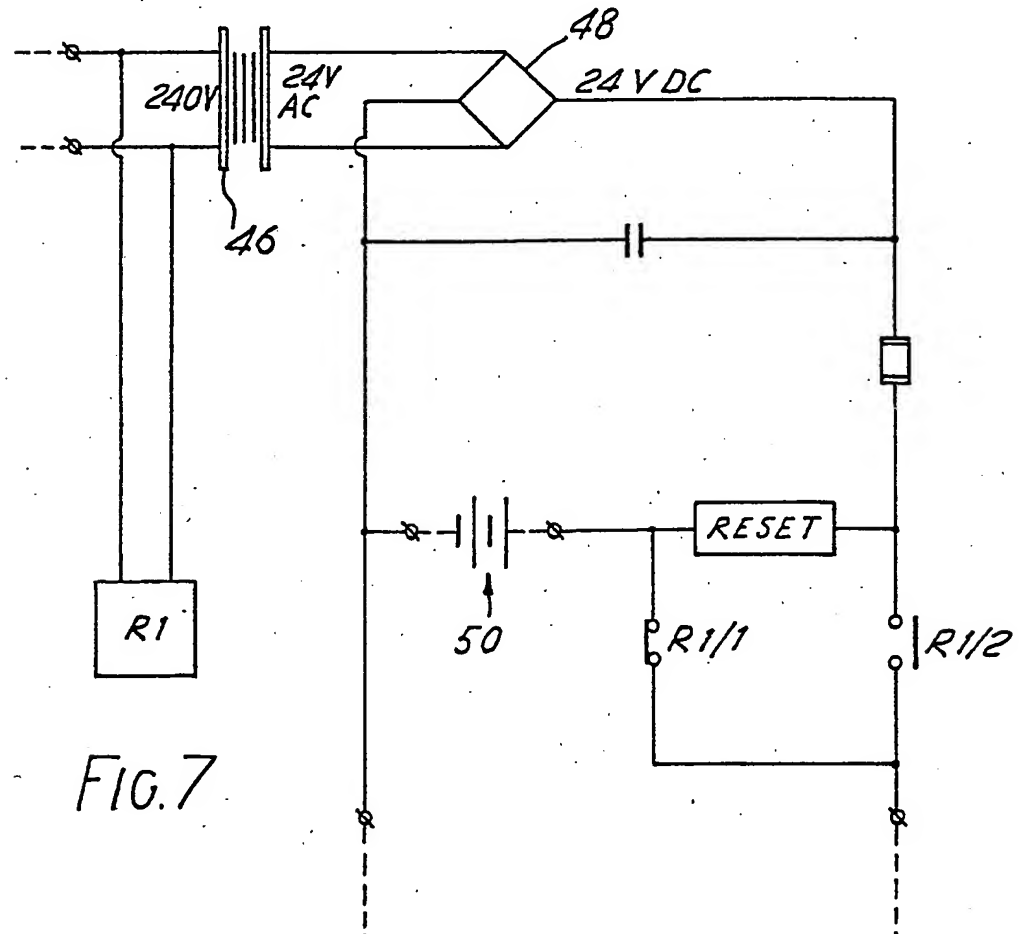
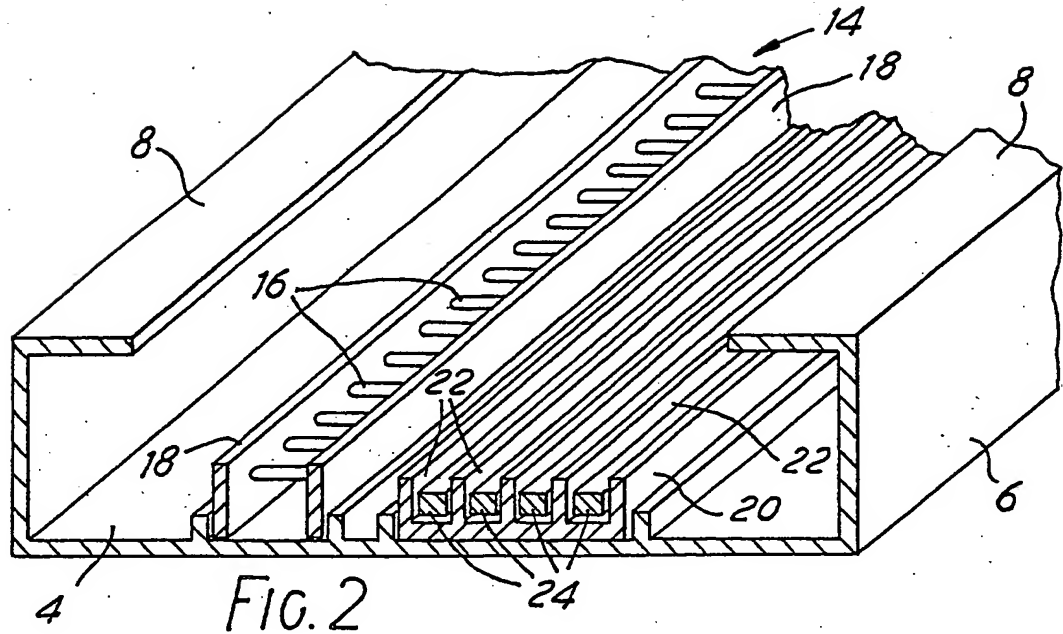
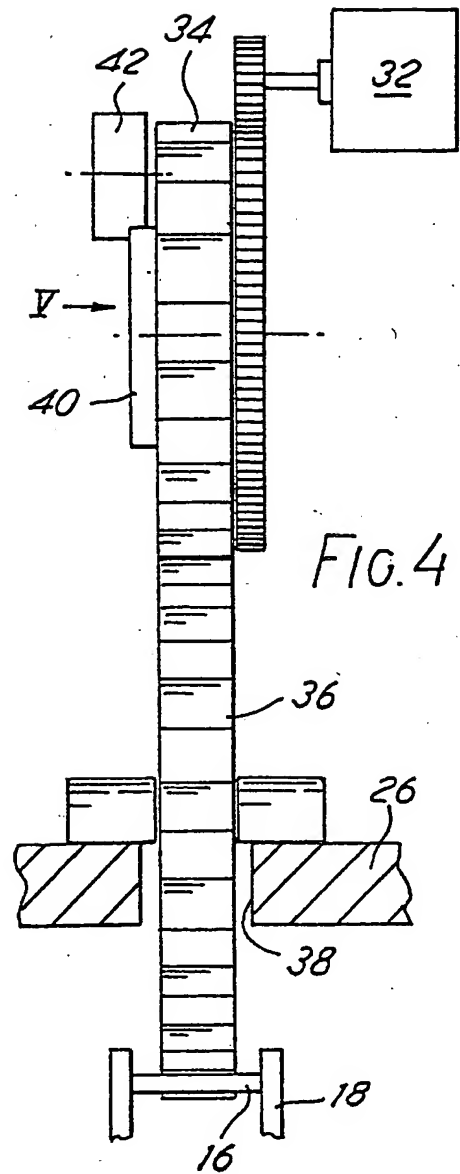
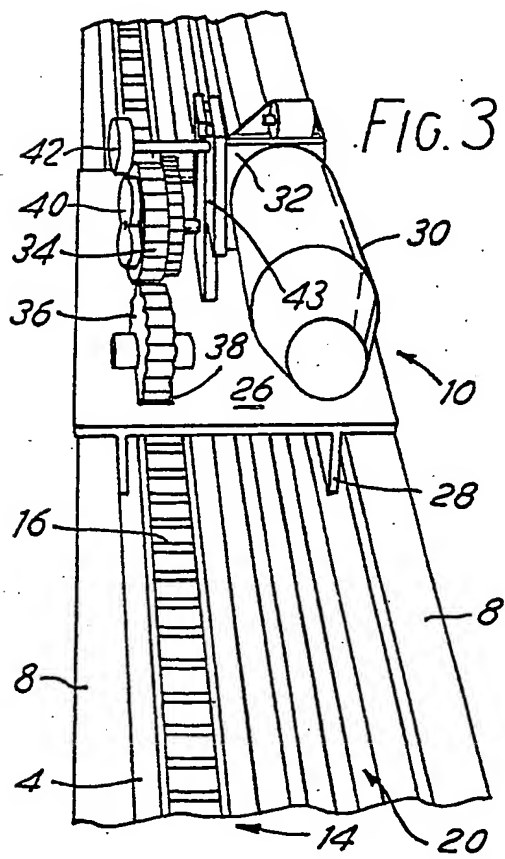
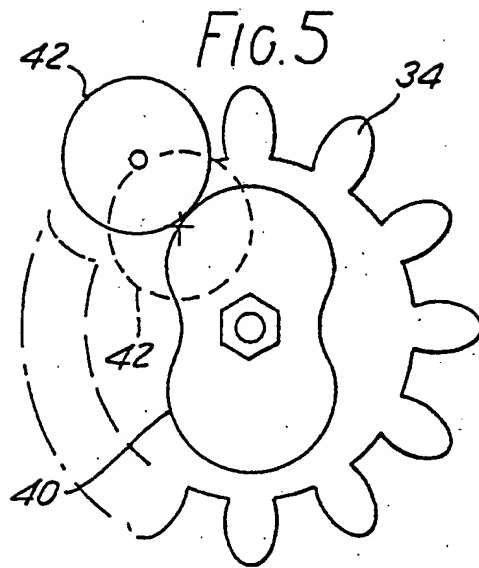


FIG. 1

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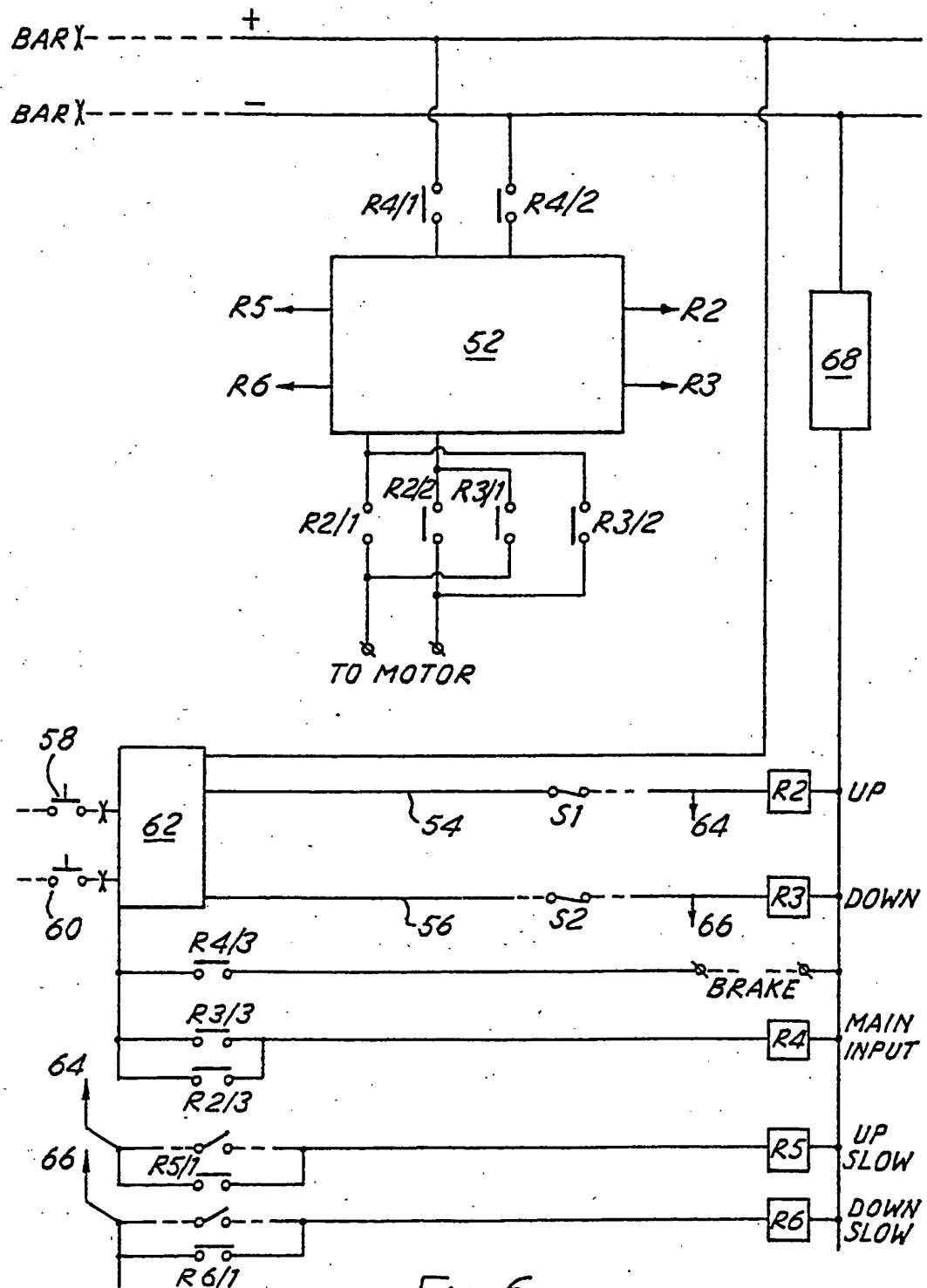


FIG. 6

## SPECIFICATION

## Stairlift

- 5 The invention is concerned with improvements in or relating to stairlifts, particularly to stairlifts capable of operation by battery particularly but not exclusively in the event of mains failure.

- It is known for stairlifts to be used to convey elderly or infirm persons on stairs which would otherwise not be usable by those persons. Such stairlifts conventionally comprise a track or rail adjoining a staircase and providing a rack with which a pinion drive is engageable to transport a carrier including a seat for the elderly person. Another alternative involves the carrier being hauled by a cable on a winding drum.

- These arrangements bring about many disadvantages including the hazard of the presence of an electric motor and winding gear obstructing a landing and the danger of live mains cables to the carriage. Moreover, in the event of mains failure the user may be stranded partway up the stairs. If a stand-by battery is provided on the carrier, this adds to the weight and size to be transported and this is compounded if battery charging means are included to ensure the immediate efficient use of the standby battery at all times in order to enable the person to complete his/her traverse of the stairs.

- The invention seeks to obviate the above disadvantages.

- The invention provides a stairlift for the transport of persons upon a flight of stairs comprising a carrier including a seat, a D.C. motor adapted to operate a pinion drive, a rack engageable by said pinion drive and mounted in an elongate base member adapted to extend the length of said flight, said base member also supporting low-voltage power-carrying track, wherein the carrier is provided with pick-up means adapted to supply the motor with power from said track, and a circuit supplying said low voltage power from a mains source through a transformer and wherein in the event of the absence of mains power, power from a battery is supplied to the circuit, said battery being remote from the carrier and remaining stationary with respect to the track.

- Preferably the track comprises a plurality of conductive strips or rods adapted to supply power to said motor. Conveniently, the track may include strips or rods adapted to carry power to operate control means including carrier summoning means. Advantageously, the strips or rods are received in insulated recessed portions of the track.

- In an example, the drive motor includes fail-safe means operable in the event of mal-function or excessive speed of traverse.

It will be apparent that the movement of the carrier may be controlled by a switching device thereon or alternatively, if desired, by remote control.

- There will now be described with reference to the drawings, an example of a stairlift according to the invention. It will be understood that the description is given by way of example only and not by way of limitation.

In the drawings:-

- 65 *Figure 1* is a diagrammatic view in side elevation of

a stairlift according to the invention;

*Figure 2* is a perspective view partly in section of a track of the stairlift;

- Figure 3* is a perspective view of the carrier of the stairlift with the seat removed for clarity;

*Figure 4* is a view of the pinion drive arrangement of the stairlift;

*Figure 5* is a view on arrow V of *Figure 4*;

*Figure 6* is a general circuit diagram; and

- 75 *Figure 7* is a diagram of the standby battery power circuit.

- A flight of stairs 2 is provided with an elongate base member 4 having two side portions 6 and arranged to form support surfaces 8 extending the full length of the stairs for supporting a carrier indicated at 10. The upper end of base member 4 extends slightly in excess of the length of the stairs so as to allow the carrier to clear the top step of the stair flight for boarding and alighting from a swivel seat 12 mounted upon the carrier. It will be appreciated that for the convenience of the user, the chair may face sideways to or down the stairs during travel in either direction but may be swivelled so that the user has the stairs at his back when boarding. Because the stairlift is normally installed adjacent to a wall, it will be found convenient if the seat is pivotable about a vertical axis positioned at a rear portion thereof to one side adjacent the top end portion of the track.

- For the sake of appearance, a suitable housing is provided, conveniently moulded of fibre glass in the present example, which is fitted around the carrier.

- The base member 4 of the carrier supports a rack arrangement 14 extending the length thereof, comprising a series of metal rods 16 secured in side mounting portions 18, secured to the base member 4. Extending alongside the rack arrangement 14 is a channel member 20 of extruded plastics material and comprising four deep insulated groove-like recesses 22 into which are received metal conductor rods 24, in the present example, of aluminium. Alternatively the rods may be of copper or any other suitable material.

- Slidably mounted upon the support surfaces 8, the carrier 10 comprises a plate 26 having downwardly extending guide means 28 to which are attached nylon rollers (not shown) which run against the parts 8. Mounted upon the plate are a 24 volt DC motor 30 and associated gearbox 32 drivably associated with a first drive wheel 36, engaging with a main pinion wheel 36, which partially extends through a slot 38 in the plate 12 to engage with successive ones of the rods 16 of the rack arrangement 14.

- The wheel 34 is provided with a fail safe device operable in the event that the speed of rotation thereof exceeds a predetermined rate. This comprises a cam 40 having two lobes operable to move a cam follower 42 between two positions (full line and dotted line) during normal operation of the stairlift. If the speed of rotation of wheel 34 increases beyond a preset rate the follower 42 is prevented from reaching its dotted line position and operates a switch to cut the power to the motor 30 and at the same time releasing a spring-loaded plunger (not shown) through a lever arrangement 43, the plunger being urged downwardly between the metal rods 16 of the rack 14, so

preventing further movement of the carrier 10 upwards or downwards of the track until the mechanism can be re-set.

The power is provided to the motor 30 from a mains source through circuitry outlined in Figure 6 and 7, so that the motor receives a 24 volt DC supply. This is provided at the metal rods 24 recessed in the channel member 20 and picked up by conductor members mounted on the carrier 10 and comprising spring-loaded brushes 44. (Figure 1).

In the event of mains power failure, the circuit will convert to use power from a 24-volt battery assembly 50 which is conveniently positioned beneath the stairs 2 or other remote position, as may also be a transformer 46. If the circuit is operating from the battery, a low-power emergency light (not shown) may be incorporated to assist the person using the stairlift.

The operation of the circuits will now briefly be described with reference to Figures 6 and 7.

Power for the motor is supplied through the transformer 46 to produce a 24 volt AC supply and a rectifier 48 to convert to DC. When mains power is present relay R1 maintains R1/2 closed and R1/1 open to isolate the 24V battery 50 (see also Figure 1). However, when the mains source fails, relay R1 operates to bring the battery into the circuit.

The operation of the circuit is controlled by a speed regulator 52 which effectively regulates the current and is controlled by relay R4.

Relay R2 operates when the carrier is travelling up the stairs and R3 when the direction is downwards, each of lines 54 and 56 having a limit switch S1 and S2, "up" and "down" respectively and operable by push buttons 58, 60 positioned at the head and foot of the stair flight or by a joy-stick on the carrier for operation by the user as selected at control 62.

Sensing members 64 and 66 positioned approximately 0.6 metres from the top and from the bottom respectively of the track base member 4 signal the proximity of the carrier to the end of its run so that one of relays R5 or R6 is tripped to decelerate the rate of travel in order to enable the carrier to come to a smooth stop.

There is also provision at 68 for safety switches as required including the fail-safe power cut-off arrangement described above.

Various modifications may be made within the scope of the invention as defined by the following claims.

#### CLAIMS

1. A stairlift for the transport of persons upon a flight of stairs comprising a carrier including a seat, a D.C. motor adapted to operate a pinion drive, a rack engageable by said pinion drive and mounted in an elongate base member adapted to extend the length of said flight, said base member also supporting low voltage power-carrying track, wherein the carrier is provided with pick-up means adapted to supply the motor with power from said track, and a circuit supplying said low voltage power from a mains source through a transformer and wherein in the event of the absence of mains power, power from a battery is

supplied to the circuit, said battery being remote from the carrier and remaining stationary with respect to the track.

2. A stairlift as claimed in claim 1 wherein the track comprises a plurality of conductive strips or rods adapted to supply power to said motor.

3. A stairlift as claimed in either one of claims 1 and 2 wherein the track includes strips or rods of conductive material adapted to carry power to operate control means comprising carrier summoning means.

4. A stairlift as claimed in claim 3, wherein the strips or rods are received in recessed insulated portions of the track.

5. A stairlift as claimed in any one of the preceding claims wherein the pick-up means of the carrier comprises at least one conductor means arranged to project therefrom when in motion so as to contact said track.

6. A stairlift as claimed in claim 5 wherein said conductor means comprise spring-loaded electrical brushes.

7. A stairlift as claimed in any one of the preceding claims, wherein there are provided fail-safe means operable in the event of excessive speed of the carrier in motion.

8. A stairlift as claimed in any one of the preceding claims wherein there are provided manually operated switch devices on the carrier for operation by the user and also at a point remote from the track for operation by remote control.

9. A stairlift as claimed in any one of the preceding claims wherein sensing members are provided ahead of end regions of the track(s) to sense the approach of the carrier and wherein a signal sent from the appropriate sensing member causes the speed of ascent or descent to be slowed prior to stopping.

10. A stairlift as claimed in any one of the preceding claims, wherein the seat provided on the carrier is pivotally mounted thereon about a vertical axis positioned at a rear portion thereof to one side adjacent the top end portion of the track.

11. A stairlift for the transport of persons upon a flight of stairs, constructed and arranged as hereinbefore described with reference to and as shown in the drawings.